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ESTIMATES OF THE EFFECTS OF EDUCATION AND TRAINING ON EARNINGS

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Executive Summary

Considerable amount of public and private resources are invested in education and training. And, while there is substantial research supporting the view that education has a positive impact on earnings, evidence on the impact of training on wages is not as clear-cut. With the decline in the number of jobs requiring only a high school education, federal and state policy makers have enacted legislation intended to increase the acquisition of both education and training with the end goal of increasing the overall standard of living, particularly among the relatively poor. Many factors potentially influence the wage an individual receives, including innate ability, experience, education, training, occupation, individual characteristics such as age, race and gender, personal choice, and luck. This report provides a review of key economic literature on the wage-effects of training and presents empirical evidence on the effect of training, independent of other important forces, particularly general education, on individual wages.

Highlights of Empirical Findings

The following are the principal findings of the empirical research we conducted.

- The acquisition of training increased hourly wages by an average of 4.6 percent overall.
- Training has a positive and significant influence on hourly wages for both men and women; however, the effect for women is larger than for men.
- Similarly, longer periods of training are associated with higher hourly wages for both men and women; however, the effect remains larger for women.
- Training had a positive effect on hourly wages in 7 of the 12 major occupation categories (5 were statistically significant).
- Training length had a positive effect on hourly wages in all but one of the 12 occupations (8 were statistically significant).

- In 5 of the 12 occupations training was associated with declines in hourly wages, and in one of the 12 occupations training length was associated with a decline in hourly wages. However, none of declines in hourly wages were statistically significant.

Findings from the Literature

Summarized here are the findings of several key studies of the wage-effects of training and education. These studies focus on different time periods, populations, and types of training and education. The existing evidence suggests that the return to training is positive and significant for adults. The size of the benefits, however, varies depending upon the individual's socio-economic characteristics and the program in question. In general, women benefited from training more than men, both in actual dollars and as a percentage of their pre-program wages. However, women, especially those who received AFDC (public assistance), usually started off with lower wages and fewer workplace skills than males.

The implications of training on youths are relatively pessimistic. Most studies found very little impacts of training on wages. For young males, the effects of training were often negative, and for males with arrest records, the negative effects were large and statistically significant. No study made serious attempts to explain why youths differ from adults in their wage responsiveness to training. However, the answer may lie with the fact that youth (especially youth offenders) are more likely to have an acute lack of previous job experience or the possibility of a stigma associated with program participation. Several studies indicated that previous workplace experience was a significant determinant of wages, and youths are less likely than adults to have previous job experience. Youth also change jobs relatively frequently; thus, specific training may not be relevant to the current job and hence unrelated to current wages. It was also suggested that systematic discrimination against program participants might cause the

effect of training on wages to be negative; for example, it may be that employers associate government sponsored job training with youth offenders.

Education is also found to have positive impact on wages. In general, men's wages have been found to respond more than women's wages to additional education. The returns to most forms of education have remained relatively stable, including the category 1-to-3 years of college; however, the push toward higher productivity and the decline in low-skill jobs have caused the returns to middle school education to suffer serious decline over the past three decades.

Regression Estimation of Wage Equations

The 1991 Current Population Survey Jobs Training Supplement was used to estimate the effect of training on wages controlling for other factors that are expected to affect wages. Hourly earnings of 8,954 respondents were reported. However, of the individuals reporting hourly earnings, only 7,924 individuals provide information on both training and education.

The literature suggests that the effect of training differs by sex and by occupation. For comparison we produce three sets of estimates. The first set contains a single regression, which estimates the effect of training for the entire sample of 7,924 individuals. This regression provides the average effect training has on wages across all occupations and both sexes. The second set divides the sample by gender to estimate separate regressions for males and females. By estimating separate regressions we can isolate gender-specific wage effects of training. The third set divides the sample into 12 occupational groups. A common perception is that within some specialized occupations wages are highly positively correlated with the amount of training an individual has, while in other non-specialized occupations training may have only a small influence on wages. By estimating separate regressions for each of the 12 occupational groups we allow for training to have different wage effects for each occupation. These three sets of estimates allow us to both measure wage effects of training and determine who benefits most from training. Since a person with more ability (and a higher wage) may be more likely to receive training, we must control for this in estimating the effect of training on

wages. To do this we use a two-stage regression model. In the first stage we estimate the likelihood of receiving training and in the second stage we estimate the effect of training on wages.

Full Sample

The overall results are consistent with the findings in the established literature. The results of the full sample indicate that the probability of receiving training is positively correlated with a person's perception of their skills adequacy. This result means that individuals who believe their skills are adequate for their current job are more likely to have received training. Individuals with more education and more experience with their current employer are also more likely to receive training than those with less. Additionally, non-whites are less likely to receive training than whites.

The second stage indicates that for the entire sample attending high school and graduating from high school have a negative impact on hourly wages over never attending high school. However, attending college has a strong positive impact on wages. After controlling for educational attainment, both the presence and the length of training have a positive and significant influence on wages. The acquisition of training increased hourly wages an average of 4.6 percent for the entire sample. As expected, being females or nonwhite is associated with lower hourly wages.

Gender-Stratified Sample

For both males and females, individuals who believe their skills are adequate for their current job are more likely to have received training. Individuals with more education and more experience with their current employer are also more likely to receive training than those with less. Unlike the results from the full sample, non-white females are no less likely to receive training than white females. However, black males are less likely to receive training than white males.

Training has a positive and significant influence on hourly wages for both men and women; however, for women the effect is larger than for men. Similarly, longer periods of training are associated with higher wages; however, the effect is larger for women.

One notable gender-based difference comes in the wage response to the presence of children under 18. Females with children under 18 earn less than other females, while men with children under 18 earn more than otherwise similar men.

Occupation-Stratified Sample

For the occupation-stratified regressions the perception of ones' own skills continued to be strongly positively correlated with the acquisition of training. Being female reduced the probability of receiving training for most occupations except for administrative support and other services. Being non-white also reduced the likelihood of training for occupations other than machine administrative support, handlers and equipment cleaners and other services.

Training had a positive effect on hourly wages in 7 of the 12 occupation categories (5 were statistically significant). Training length had a positive effect on hourly wages in all but one of the 12 occupations (8 were statistically significant). In 5 of the 12 occupations training was associated with declines in hourly wages, and one of the 12 occupations training length was associated with a decline in hourly wages. However, none of declines hourly wages were statistically significant. After controlling for training, females and non-whites received lower wages than their white and male counterparts.

Overall Conclusions

The three sets of regressions and the literature provide convincing evidence that training has a positive influence on wages. However, the gender-stratified regressions suggest that training is more important in determining females' wages. Furthermore, in the occupation-stratified regressions the amount of training seems to be more important than the presence of training in determining hourly wages.

Two Approaches

There are two major methods that have been employed to measure the impact of training and education on wages, non-experimental (i.e., statistical) and experimental.

Non-Experimental

The first methodology is the traditional (non-experimental) approach that utilizes survey data containing wages, educational attainment, training (if separate from education), and individual characteristics, which may include measures of ability. This approach typically uses Ordinary Least Squares (OLS) regression analysis to discern the relationship between wages and education and/or training. However, it has been argued that the resulting estimates of the effect of education and training are statistically biased because the approach does not account for which individuals actually obtain training. (A statistical bias exists when there is a probability that the estimated effect of training or education either over or understates the actual effect of education or training on wages.) In the case of measuring the effect of education and training on wages there are three main potential biases.

a. Ability bias. In this context ability bias exists if some unobserved or unmeasured characteristic of the individual, e.g., innate ability, is related to both the level of education (or training) one receives and that person' s wages. The estimation problem is that the researcher cannot discern the true or actual relationship between education and wages from the effect of innate ability on both the acquisition of education and wages.

b. Selectivity bias. An individual may choose to go to college to become a manager, rather than end his education at high school and becomes a mechanic. He may do so because he has a very low aptitude for mechanical trades and would earn less than others would in that occupation. Another individual might choose to forgo college and become a mechanic because he has a low aptitude for becoming a manager and would earn less than others in the field. If people sort themselves in this manner, the difference in earnings between individuals will understate the effect of a college degree for the person who chooses to attend college since his alternative wage as a mechanic would have been lower than the wage of the person who is a mechanic. Similarly, the measured return will overstate the effect of college for the person choosing not to attend college since he would have earned a

lower wage for the managerial occupation than the person who attended college. This type of sorting is what is expected if people specialize in fields in which they are naturally inclined.

c. Measurement error bias. This bias arises because studies frequently omit fringe benefits and working conditions in the estimation of benefits from education. Money earnings are measured rather than total compensation. It is believed that by ignoring fringe benefits and working conditions, the estimated effects of education and training is biased downward. However, very little information exists on the magnitude of this bias.

Experimental

The second approach to estimating the effects of training on wages uses a program experiment. Since, as has been argued, selection is a problem in the first approach, one method of accounting for this bias is to perform a social experiment that randomly assigns eligible program participants into treatment and control groups. The underlying assumption is that by randomly assigning eligible program participants into these two groups, researcher are able to artificially construct groups of similar individuals who only differ on average by their program participation. Hence, the experience of the control group provides a valid estimate of the counterfactual (i.e., no training) for the program group. Thus, any difference between the performances of the two groups is interpreted as a valid (unbiased) estimate of the impact of training.

Over the past 20 years this experimental method has gained a high level of acceptance in program evaluation. Although preferable from a research standpoint, this methodology has its limitations, the main one being the lack of opportunities to use it. There are many circumstances in which individuals cannot be excluded from the program in question.

Although the experimental and non-experimental approach differ in their applicability, in a comparison of the non-experimental with the experimental methods, LaLonde (1996) concluded that a non-experimental method that controls for selection bias yields results that are roughly comparable to those from the experimental method.

And, under some circumstances, which are determined by characteristics of the program involved, the non-experimental method is the only viable avenue for obtaining estimates of the effects of a program in the presence of selectivity bias.

Introduction

A considerable amount of public and private resources are invested in education and training. And, while there is substantial research supporting the view that education has a positive impact on earnings, evidence on the impact of training on wages is not as clear-cut. However, many government programs have been established to encourage the acquisition of post-secondary education and work-related skills. With the decline in the number of jobs requiring only a high school education, federal policy makers have enacted legislation such as the Jobs Training Partnership Act (JTPA) and, more recently, the Workforce Investment Act (WIA). The general understanding of these programs is that the acquisition of education and training translates into higher earnings. Thus, education and training are viewed as policy levers for permanently increasing the standard of living, particularly for the relatively poor. The existing empirical evidence on the effects of training on earnings, however, does not completely support the view that the acquisition of training guarantees higher wages.

Many factors potentially influence the wage an individual receives, including innate ability, experience, education, training, occupation, individual characteristics such as age, race and gender, personal choice, and luck. The goal of this report is to provide empirical evidence on the effect of training, independent of these forces, particularly general education, on individual wages.

The body of this report is contained in three main sections. The next section (Section II) provides a brief overview of the economic literature concerning the effects of training on earnings. This overview of the literature also outlines statistical problems associated with estimating the effect of educational attainment and training on wages. The findings of several key studies are presented. Section III presents a description of how wages vary by occupational groups, training, and educational attainment. Section IV provides and discusses an empirical estimation of the effects of training on wages controlling for other influences on wages.

Review of the Existing Literature

Training is defined as instruction that is job specific and focuses on specific tasks; training may be provided by the employer, a school, or private training firm (either for profit or non-profit). Education is the accumulation of a general base of knowledge that might apply to a variety of occupations or that is focused on general principles rather than specific tasks. Human capital refers to all skills, both general and specific, which may be gained through education, on-the-job training, experience, or other formal or informal source. For example, and individual may have 16 years of education (i.e., the equivalent of a bachelor's degree) and may have received 6 months of job-specific training. This person's education and training, along with any experience he has, determines his level of human capital. Although the focus of this report is the effect of training on wages, it is necessary to discuss other aspects of human capital attainment in order to distinguish between the effects of each.

There is considerable debate in the published literature as to the effectiveness of training in augmenting wages. The existing evidence suggests that the type of training received, the characteristics of the person receiving it, and, in some cases, the circumstances of the training, have substantial effects on the relationship between wages and training.

Several researchers have attempted to estimate the effect of different types of human capital acquisition on wages, but because human capital is comprised of different types of knowledge and skills, each researcher is only able to address very specific component of human capital. Some studies focus on specific socioeconomic groups (e.g., low-skilled females), on particular periods of education (e.g., high school) or on government sponsored training programs (e.g., Job Corps). This has led to difficulty in drawing general conclusions about the effects of training. We first discuss the general approaches to estimating the effects of training on wages and then discuss the existing studies.

A. Methods of Past Studies

There are two major methods that have been employed to measure the impact of training and education on wages, non-experimental (i.e., statistical) and experimental. The following subsection presents and compares the general findings of several studies that make use of either experimental or non-experimental methods.[1]

1. Non-Experimental

The first methodology is the traditional (non-experimental) approach that utilizes survey data containing wages, educational attainment, training (if separate from education), and individual characteristics, which may include measures of ability. This approach typically uses Ordinary Least Squares (OLS) regression analysis to discern the relationship between wages and education and/or training. However, it has been argued that the resulting estimates of the effect of education and training are statistically biased because the approach does not account for which individuals actually obtain training. (A statistical bias exists when there is a probability that the estimated effect of training or education either over or understates the actual effect of education or training on wages). In the case of measuring the effect of education and training on wages there are three main potential biases.

One type of bias that exists is referred to as *ability bias*. Ability bias exists in this context if some unobserved or unmeasured characteristic of the individual, e.g., innate ability, is related to both the level of education one receives (or training) and that person's wages. For example, suppose educational attainment is positively related to intelligence or innate ability. If a particular individual has relatively high intelligence, he is more likely to attain a larger amount of education and training. Higher intelligence might also enable the individual to obtain a relatively high wage regardless of education or training. The estimation problem is that the researcher cannot discern the true or actual relationship between education and wages from the effect of innate ability on both education and wages. If the effects of intelligence on

[1]It should be noted that these studies estimate the economic effects of different types of education and training over a wide range of individuals, economic conditions and time periods. No attempt has been made to compare the magnitudes of the effects between studies, nor have any of the estimates been adjusted for differences in economic conditions, such as cost of living. All dollar amounts are in current dollars (unadjusted for inflation) and estimates do not account for local differences in supply and demand for particular skills.

wages and educational attainment are ignored, the effect of educational attainment on wages will be overstated. In other words, without knowledge of the individual's intelligence, all of the increase in earnings will be attributed to the acquisition of education and none to innate intelligence.

Second, statistical bias may exist in the form of *selectivity bias*. An individual may choose to go to college to become a manager, rather than end his education at high school and becomes a mechanic. He may do so because he has a very low aptitude for mechanical trades and would earn less than others would in that occupation. Another individual might choose to forgo college and become a mechanic because he has a low aptitude for becoming a manager and would earn less than others in the field. The empirical analysis essentially uses the difference in the two earnings to measure the effect of a college degree. If people sort themselves in this manner, the difference in earnings will understate the effect of a college degree for the person who chooses to attend college since his alternative wage as a mechanic would have been lower than the wage of the person who is a mechanic. Similarly, the measured return will overstate the effect of college for the person choosing not to attend college since he would have earned a lower wage for the managerial occupation than the person who attended college. This type of sorting is what is expected if people specialize in fields in which they are naturally inclined.[2]

[2]To reduce the statistical bias introduced by selection in training, researchers utilize a modified version of the non-experimental approach, developed by Heckman (1979), that accounts for the likelihood that an individual decides to acquire education and training. This modified approach consists of a two-stage regression. The first stage is comprised of a probit regression in which the dependent variable is a zero-one dummy variable measuring whether the individual participated in training. From this regression a variable, Lambda, is constructed which is the Inverse Mills Ratio for the probability of receiving training. The second stage consists of a restricted OLS wage regression of only individuals who received training with Lambda as an additional regressor. Heckman shows that by explicitly modeling the choice to acquire training, we are able to eliminate the bias introduced by unobserved differences in potential earnings caused by things other than training. For a more detailed description of this estimation approach see Greene (1981) or Maddala (1983).

A third bias, *measurement error bias*, arises because studies frequently omit fringe benefits and working conditions in the estimation of benefits from education. Money earnings are measured rather than total compensation. It is believed that by ignoring fringe benefits and working conditions, the estimated effects of education and training is biased downward. However, very little information exists on the magnitude of this bias.

2. Experimental

The second approach to estimating the effects of training on wages uses a program experiment. Since, as has been argued, selection is a problem in the first approach, one method of accounting for this bias is to perform a social experiment that randomly assigns eligible program participants into treatment and control groups. The underlying assumption is that by randomly assigning eligible program participants into these two groups, researcher are able to artificially construct groups of similar individuals who only differ on average by their program participation. Hence, the experience of the control group provides a valid estimate of the counterfactual (i.e., no training) for the program group. Thus, any difference between the performance of the two groups is interpreted as a valid (unbiased) estimate of the impact of training.

Over the past 20 years this experimental method has gained a high level of acceptance in program evaluation. Although preferable from a research standpoint, this methodology has its limitations, the main one being the lack of opportunities to use it. There are many circumstances in which individuals cannot be excluded from the program in question. For example, in an attempt to measure the impacts of different majors in colleges on wages, a researcher cannot randomly exclude individuals from obtaining a particular degree. Also, even when randomization is possible, it is sometimes difficult to convince program administrators to exclude eligible participants, even temporarily.

In a comparison of the non-experimental with the experimental methods, LaLonde (1996) concluded that a non-experimental method that controls for selection bias (see above and footnote 2) yields results that are roughly comparable to those from the experimental method. And, under some circumstances, which are determined by characteristics of the program involved, the non-experimental method

is the only viable avenue for obtaining estimates of the effects of a program in the presence of selectivity bias.

B. Evidence from the Non-Experimental Approach

There are several studies focused on federal job training programs and their effects on wages;[3] however, because of the different time periods associated with each study the effects of education on wages are not directly comparable between studies.[4] A program evaluation of the 1962 Manpower Development and Training Act (MTDA) by Ashenfelter (1978) found an overall positive effect of the MTDA on earnings. Males experienced between $150 and $500 yearly earnings increase, while women experienced a $300 to $600 increase. In a study re-examining Ashenfelter's results, Bloom (1984) found that training under the MTDA had increased the earnings of men by $500 to $800 per year and women by $600 to $800. Additionally, these wage increases persisted for up to 5 years after the end of the program.

In an evaluation of the Comprehensive Employment and Training Act (CETA), which replaced MTDA, Ashenfelter and Card (1985) used longitudinal data and found that the effect of training on women was consistently positive and amounted to $300 to $700 per year. However, they found men's response to training more sensitive to the specification of the regression. Later studies of CETA (Dickerson et. al. 1985) also found that the results were dependent upon specification, and that only women's wages were generally positively affected by training.

The general results are consistent with the expectation that wages increase as education and training is acquired. Some research, however, indicates that for certain population sub-groups the impact of training might be negative. In Schiller's (1978) investigation of the impacts of the CETA on wages, he finds that, for individuals with no job experience, nearly all female sub-groups and some male sub-groups reported a decline in wages after training. Likewise, Gay and Borus (1980) and Bassi (1983) report similar negative impacts of training for certain females and minority-male sub-

[3]The literature addressing the effects of education on earnings is very large, only selected papers are addressed here. For a general overview of the returns to education see Bound and Johnson (1992).

[4]The dollar amounts presented in the review of the literature are in nominal dollars and are not adjusted for inflation.

groups. Dickerson et. al. (1986) found for some specifications that men's wages declined with participation in CETA. One possible explanation for these findings is that training may divert participants from productive job searches. A second explanation is that employers may discriminate systematically against federal training program participants, perhaps because the training program stigmatizes those trainees.

In a comprehensive study of private sector training, Lillard and Tan (1992) estimated both the likelihood of receiving training and the effect of training on wages for young men, women and individuals characterized as economically disadvantaged. They found that educational attainment is positively related to the amount of training received. For young men, women and the economically disadvantaged, the likelihood of getting most kinds of training rises with the level of educational attainment.[5] They also found that the effect of training on wages varied by the source of training. Company sponsored training had the largest wage effect and was found to persist for 13 years. Private training obtained from regular school sources had a positive but relatively small effect on wages; however, the effect disappeared within 7 years. Notably, when estimating the effect of all training programs Lillard and Tan found an 11.9 percent increase in annual wages. And, this increase diminished at a rate of 1.1 percent per year for 11 years.

Lynch (1992) estimated the effect of private, firm-sponsored training and found that after controlling for industry and occupation, the various measures of training have a positive and significant impact on wages. Weeks of on-the-job training and apprenticeship with the current employer have a significant positive impact on the individual's wages. Other training-related variables having a positive impact on wages are years of schooling and experience on the job. One interesting finding is that individuals who have a high school degree or some post-secondary schooling receive a wage premium for on-the-job training. However, those individuals who have not earned a high school degree actually receive lower wages during the training period. Lynch suggests these finding reflect that employers are faced with providing general training to employees who have not finished high school, and are passing on some of the cost to the employee who requires the training.

[5] This was true for all educational categories except the very highest.

In measuring the wage benefits of education, Willis and Rosen (1979), using a sample of individuals eligible for the "GI" bill, found that the economic return to a college degree (over a high school degree) is about 9.8 percent over the individual's lifetime, after controlling for selectivity bias, i.e., the non-randomness of the decision to attend college.[6] They found that those who did not attend college would have earned less than the average wage for college graduates, had they chosen to attend college, and that a person choosing to attend college would have earned less than the average high school graduate, had they chosen not to attend college. Willis and Rosen did not, however, find significant evidence of ability bias, perhaps due to the sample containing relatively similar individuals.

McMahon (1991) used microeconomic data from the U.S. Census to estimate the returns to education over the period between 1967 and 1987. For those with college degrees, his findings are very similar to Willis and Rosen's, namely that the average rate of return for a college degree (over a high school degree) is 10.2 percent over the period. The rate of return fell to a low of 8 percent in the early 1970's as a result of the increased number of individuals graduating from college. However, since then the rate of return rose and remained between 10 and 13 percent for the duration of the period he considered. From 1 to 3 years of college yielded a "steady" 6 percent return. The average rate of return for a high school degree (over no high school degree) over the period also held relatively stable, averaging around 12.8 percent. Although the return to secondary and post-secondary education remained stable or increased slightly, the returns to junior high school fell dramatically from 21 percent in 1967 to 7 percent in 1987.

According to McMahon, compared with other common investments, education throughout the 1970's and 1980's was a good investment, yielding nearly twice the rate of return for housing and real estate; however, it was not the best investment. The return to investment in physical capital over the same period was estimated to be about 3 percent higher than the return to education. However, adjustments were not made for fringe benefits associated with jobs requiring more education.

It has also been hypothesized that returns to education are subject to diminishing returns, i.e., the returns to college are positive, but not as high as the returns to high

[6] The rate of return was 9.0 percent before adjustment.

school. Neither the Willis and Rosen nor the McMahon article provides any support for this hypothesis.

C. Evidence from the Experimental Approach

The experimental approach has been most fruitful in determining the effectiveness of government-funded employment related programs, many of which focus on welfare recipients. Hollister and Maynard (1984) found that AFDC recipients who participated in job training and placement programs earned higher average wages and worked more hours that those in the control group. In the early months of the program, some of this can be attributed to the fact that the participants were offered full-time jobs paying at least minimum wage, while the control group did not receive these benefits. However, even after the participants left the program wages and hours worked stabilized and remained above those of the control group for the remainder of the 27-month experiment, about 10 months. For the participant group, Hollister and Maynard report a 7 to 8 percent higher employment rate, a 15 to 17 hour increase in monthly hours worked, and a $69 to $81 increase in monthly wages as compared with the control group.

Couch (1992) also found that supported work programs increased the wages of adult AFDC recipients over individuals in the control group, and that the increase in wages persisted after the end of the program. However, the effects on youths were not as large; the differences between wages for the treatment and control group were not statistically different for the post-program years.

These general findings were echoed by Bloom et. al. (1997). In this comprehensive study of the impact of the JTPA, it was found that the only significant positive impact of training on wages were for adult women and, to a lesser degree, adult men. Surprisingly, the largest impact was from adult women receiving AFDC. For these individuals, on-the-job training and job search assistance had an average annual impact of $2,387 per enrollee. Young male non-arrestees and young females were found to have not significantly benefited from training. However, male youths with a criminal past were actually found to have experienced a statistically significant decline in wages due to training, a result which remained unexplained.

D. Synthesis of Findings

The existing evidence suggests that the return to training is positive and significant for adults. The size of the benefits, however, varies depending upon the individual's socio-economic characteristics and the program in question. In general, women benefited from training more than men, both in actual dollars and as a percentage of their pre-program wages. However, women, especially those who received AFDC, usually started off with lower wages and fewer workplace skills than males.

The implications of training on youths are relatively pessimistic. Most studies found very little impacts of training on wages. For young males, the effects of training were often negative, and for males with arrest records, the negative effects were large and statistically significant. No study made serious attempts to explain why youths differ from adults in their wage responsiveness to training. However, the answer may lie with previous job experience or the possibility of a stigma associated with program participation. Several studies indicated that previous workplace experience was a significant determinant of wages, and youths are less likely than adults to have previous job experience. Youth also change jobs relatively frequently; thus, specific training may not be relevant to the current job and hence unrelated to current wages. It was also suggested that systematic discrimination against program participants might cause the effect of training on wages to be negative; for example, it may be that employers associate government sponsored job training with youth offenders.

Education is also found to have positive impact on wages. In general, men's wages have been found to respond more than women's wages to additional education. The returns to most forms of education have remained relatively stable, including the category 1-to-3 years of college; however, the push toward higher productivity and the decline, low-skill jobs have caused the returns to middle school education to suffer serious decline over the past three decades.

Human Capital and Wages by Occupation

The decision to acquire education or training is based, at least in part, on an expectation of future earnings. The most common way to estimate the future wage benefits of education or training is to compare the wages of similar individuals with different levels of education or training. This section presents a description of how wages vary by occupational group, the presence of training, and educational attainment.

A. Data

The data used in this report come from the Current Population Survey (CPS), January 1991: Job Training Supplement, and from the 1998 CPS Annual Demographic File. The Job Training supplement was conducted as part of the 1991 January population survey. The 1991 January CPS consists of a sample of 161,174 cases (or 57,000 households). The supplement is a sub-sample of the January CPS comprised of approximately 20,000 employed or recently employed persons age 14 and over. Associated with these individuals are demographic characteristics such as race, age, gender, wages, educational background, etc. The advantage of this data set is that it contains a section that has more detailed information than other secondary data sets about: skills and training that workers needed to obtain their current or last job; on-the-job training; skills used on their last job, and; workers perceptions about the adequacy of their skills. Also reported is detailed information on occupation and industry of each individual's employment. However, one disadvantage of using these data is the relatively small number of people who respond to both the training questions and report their occupation. Another disadvantage is the age of the data. It has been suggested that technological changes since 1991 may have influenced the returns to training for specific technical occupations which will not be reflected in our estimates.

The 1998 CPS Annual Demographic File contains labor force data as well as supplemental data on work experience, education, and income. It contains comprehensive information on individuals' employment status, occupation, industry of work and demographic characteristics, such as race, age, gender, and household relationships. This data set consists of approximately 60,000 households from across

the U.S., and contains information for about 131,000 individual respondents. This data set has the advantage of being more current and having better representation for specific industries; however, it does not contain information regarding the level of training. The relative strengths and weaknesses of the 1991 CPS Jobs Training Supplement and the 1998 CPS Demographic File cause us to use both.

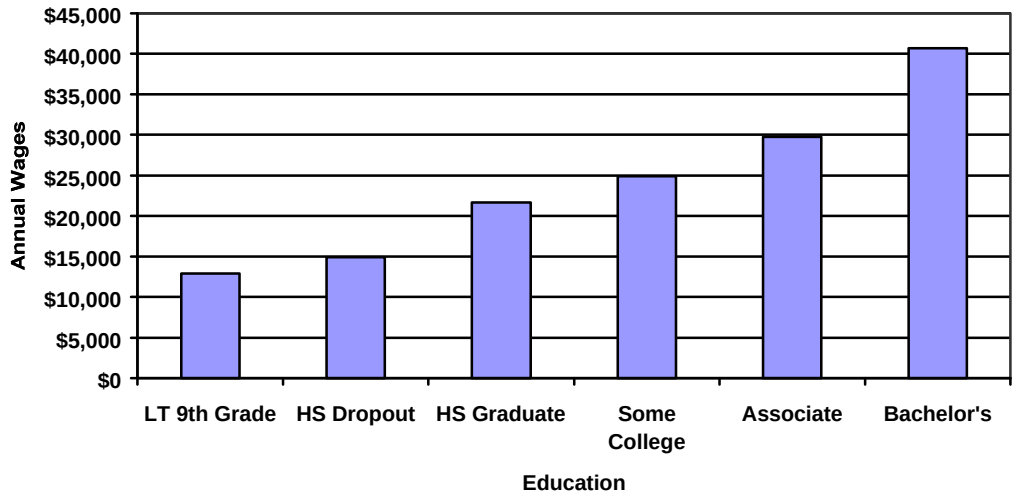
Since this report concentrates on how education and training affect wages of individuals with a four-year college degree or less, persons who report more than a four-year college degree or an occupation requiring more than a four-year degree, e.g. an attorney, are excluded. The occupations represented here are grouped based on the *Standard Occupational Classification Manual*, 1980, which is produced by the U.S. Department of Commerce, Office of Federal Statistical Policy and Standards. The sub-sample of college graduates in the 1991 CPS Jobs Training Supplement does not provide enough variation to include this group in the analysis of training in Figures 2-4.

B. Comparisons of Education, Training, and Wages

Simple comparisons of the differences in yearly earnings of individuals at various levels of education or training are often offered as evidence of the benefits of acquiring more education or training. Figure 1, published by the Postsecondary Education Opportunity, was constructed from data from the U.S. Bureau of the Census. Figure 1 shows that individuals with progressively higher levels of education have progressively higher annual earnings.

Such graphs, however, can be misleading for several reasons. First, Figure 1 does not account for differences in hours worked among education levels. Some of the differences in yearly earnings may be attributable to systematic differences in the number of hours worked by educational groupings, i.e., the average person with a bachelor's degree may work more hours than the average high school dropout. By using hourly wage rates instead of annual earnings any systematic differences in hours worked can be avoided. Additionally, since less educated workers are usually paid by the hour, hourly wages provides a more concrete measure of the monetary benefits of education or training.

FIGURE 1. AVERAGE ANNUAL EARNINGS FOR PERSONS BY EDUCATION ATTAINMENT



Source: Postsecondary Education Opportunity

The relationship between hourly wage and the level of education or training is shown in Table 1, which compares average hourly wage for individuals with different education and training combinations, by occupation. Occupations that are bolded represent 1-digit SOC (Standard Occupational Classification) occupations. Education categories consist of less than high school diploma, high school diploma, and one, two, and three years of college completed. A person is considered as having received training if he obtained training either to qualify for his current position or to improve skills necessary in the current position. Years of education, which include academic degrees, are not considered part of training. Although professional degrees, such as a degree in engineering or accounting, consist of both education and training, we consider them as education.

Table 1 is organized so that the effect of training for a given education level may be identified by comparing adjacent columns with the same level of education. The effect of education may be identified by comparing every other column, which contain similar training levels. In general, Table 1 shows that hourly wages are positively related to both training and education. However, the nature of this

Tbl-1.

Training/Education

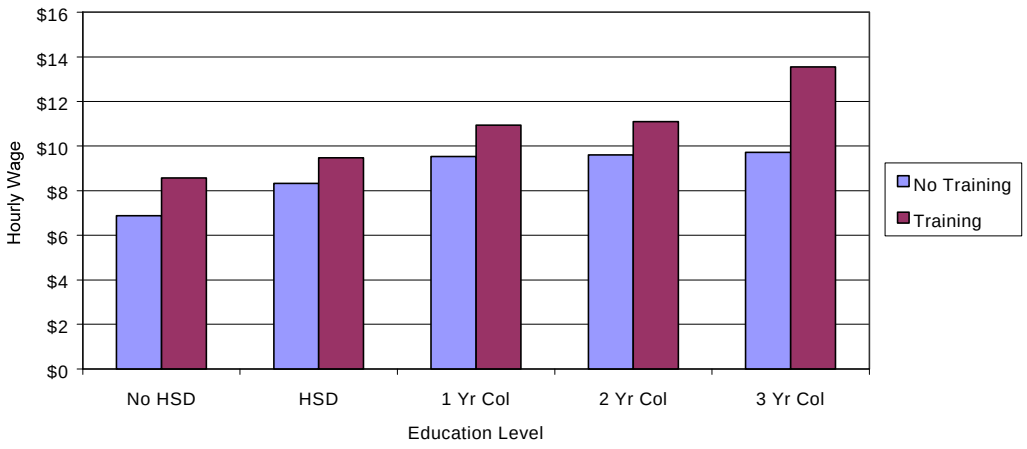
Occupations and Subdivisions (1991 CPS Jobs Training Supplement)	Sample Size	No Training/No HSD	Training/No HSD	No Training/HSD	Training/HSD	No Training/1 Yr Col	Training/1 Yr Col	No Training/2 Yrs	Training/2 Yrs col	No Training/3 Yrs col	Training/3 Yrs col	No Training/4 Yr Degree	Training/4 Yr Degree
Technicians and Related Support	**222**	**8.40**	**10.08**	**10.18**	**9.38**	**11.65**	**11.30**	**16.02**	**10.77**	**17.02**	**13.23**	**14.37**	**13.07**
Health Technologists and Technicians				7.50							12.26		
Engineering and Science Technicians		6.85						8.05	8.01			7.00	15.00
Engineering, and Science				5.67								8.43	
Sales	**509**	**5.39**	**4.77**	**5.94**	**6.97**	**7.89**	**6.50**	**7.54**	**13.35**	**7.44**		**6.43**	**9.94**
Supervisors and Proprietors, Sales		5.05		6.88		5.03		10.70	10.00	8.00		9.00	
Other Sales Related		5.31		5.80	6.87	6.75		6.75	6.84	7.50		7.28	8.28
Administrative Support, Including Clerical	**1105**	**7.38**	**8.56**	**8.28**	**8.09**	**9.21**	**7.93**	**9.10**	**9.18**	**9.08**	**8.16**	**9.23**	**9.12**
Supervisors-Administrative Support				8.50							9.25		7.00
Computer Equipment Operators				17.00			7.25					4.50	
Secretaries, Stenographers, and Typists				7.21	10.50			5.75	12.67	4.50	12.40		
Financial Records, Processing				7.65	10.03		7.50	6.00	10.50			7.00	10.20
Mail and Message Distributing				4.50								12.00	
Other Administrative Support, Including Clerical				7.51	9.73		5.40	7.36	8.89	5.00		9.21	5.87
Protective Services	**110**	**6.03**	**8.50**	**10.31**	**12.86**	**14.66**	**12.18**	**8.09**	**15.28**	**9.02**	**16.00**	**14.96**	**14.29**
Other Services, Not Protect.	**920**	**5.47**	**6.76**	**6.11**	**6.53**	**6.47**	**9.11**	**6.41**	**8.68**	**5.93**	**11.25**	**5.64**	**12.35**
Health Services		6.25		4.27	4.88				9.98		8.40	11.69	
Cleaning and Building Services		5.13		5.63	6.85					5.20			
Personal Services		5.64		5.38				10.61					
Precision Production, Craft, and Repair	**665**	**7.78**	**9.60**	**8.76**	**10.59**	**11.21**	**8.60**	**12.88**	**12.30**	**6.95**		**7.27**	**10.87**
Mechanic and Repairers		8.25		9.12	9.39	8.50		7.00	12.00			5.50	
Construction Trades		8.12		10.86	6.25	7.00		12.25	12.00		17.05	11.71	
Other Precision Production		7.70		6.77	11.27			7.40			12.75	5.00	
Machine Operators, Assemblers, and Inspectors	**296**	**9.44**	**10.27**	**9.91**	**10.39**	**9.89**		**11.36**	**8.40**	**7.19**		**9.41**	
Machine Operators and Tenders, Except Precision		5.26		7.98	6.65	10.97		5.25		6.00			3.53
Fabricators, Assemblers, Inspectors, and Samplers		7.88		8.07	4.50	5.45							
Transportation and Material Moving Equipment	**399**	**6.25**	**5.00**	**7.87**	**8.94**	**6.67**	**6.00**	**8.64**				**11.55**	**10.83**
Motor Vehicle Operators		5.83		7.11	8.17	5.27		5.63				4.50	18.00
Other Transportation Occupations and Material Movers				7.39				3.85					
Freight, Stock, and Material Handlers		7.74	4.00	6.78		5.20		15.50				5.41	
Other Handlers, Equipment Cleaners, and Laborers	**73**	**5.50**		**6.29**	**6.78**	**6.36**	**23.00**	**12.00**	**5.00**	**8.00**		**8.65**	**3.53**
Farming, Forestry, and Fishing	**793**	**9.21**	**10.79**	**11.27**	**12.38**	**13.95**	**14.35**	**11.24**	**12.98**	**12.54**	**12.55**	**11.23**	**12.82**
Farm Operators				8.55									5.00
Farm Workers and Related		5.23		6.66									
Forestry and Fishing										10.50			

relationship differs by occupation. Comparisons of wages for people with similar levels of education both with and without training reveal that wage increases associated with training occur more often among service and blue-collar[7] workers than for technical, sales and administrative support occupations. The table also demonstrates a strong positive relationship between training and wage for people with a high school degree or less for most major occupational categories. But, this relationship weakens with higher levels of education. Hourly wage for blue-collar occupational categories reach a peak at or around two years of college education.

The effects of education on wages are not substantially different between occupational categories. However, it should be noted that for many of the major occupation categories the highest wage is achieved at educational levels lower than a college degree. Remember, however, that Table 1 does not control for other important factors, such as age, experience, and ability.

Figure 2 depicts the average hourly wage for all occupations by educational attainment for individuals both with and without training (but not controlling for other factors). We see that for all levels of education the presence of training is associated with a higher hourly wage.[8]

FIGURE 2. DIFFERENCES IN HOURLY WAGES BY TRAINING FOR ALL OCCUPANTS



Source: CPS 1991 Job Training Supplement

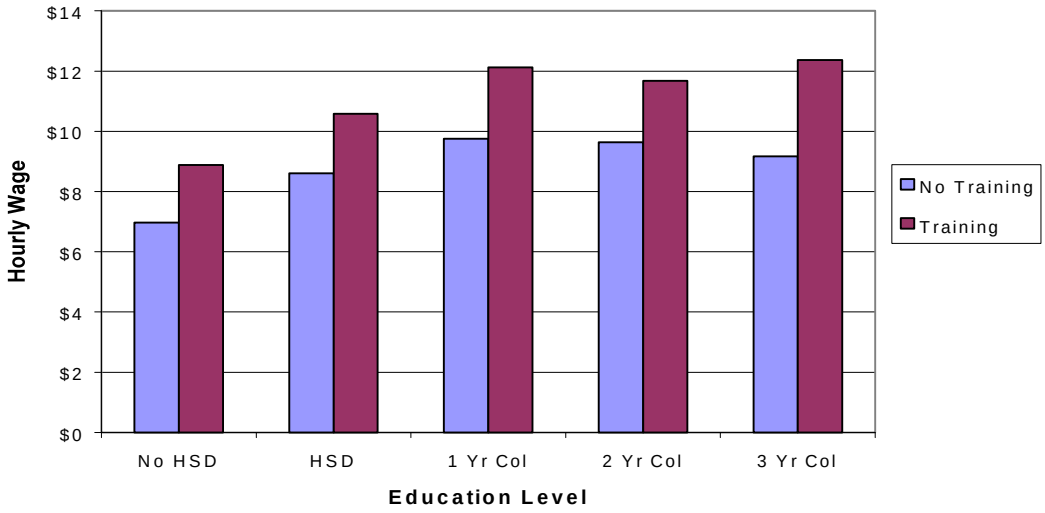
[7]Blue-collar occupations are defined as precision production, craft and repair, machine operators, assemblers and inspectors, transportation and materials moving, other handlers, equipment cleaners and laborers and farming, forestry and fishing occupations.

[8]Note, that college graduates are not included in Figures 1, 2 and 3 due to inadequate sample diversity.

Figure 3 depicts the average hourly wage for blue-collar and service occupations by educational attainment for individuals both with and without training. It is notable that individuals with one to three years of college receive similar wages, both for those with and without training; however, individuals who have received training receive substantially higher hourly wages than those without training.

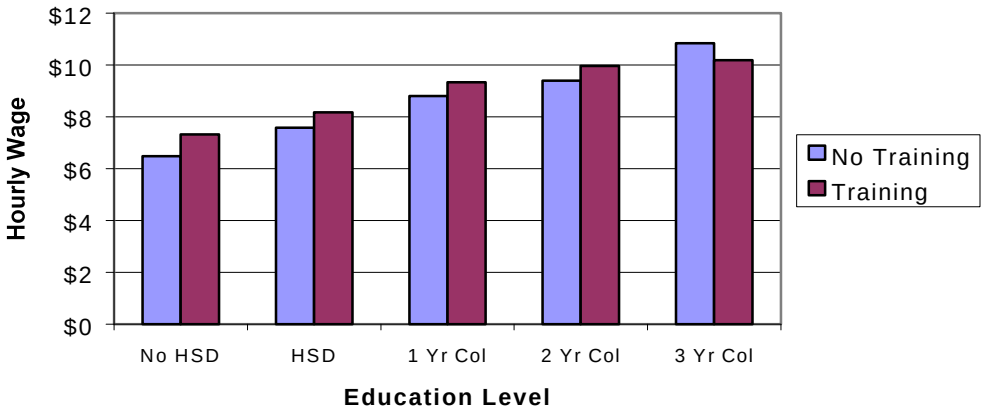
Figure 4 depicts the average wage for technical, sales and administrative support workers by educational attainment for individuals both with and without training. For these occupations training is associated with an increase in wages for all educational levels except three years of college; however, the differences in wage rates between trained and untrained individuals are relatively small in comparison with blue collar and service occupations (Figure 3).

FIGURE 3. DIFFERENCES IN HOURLY WAGES BY TRAINING FOR SERVICE AND BLUE-COLLAR OCCUPATIONS



Source: CPS 1991 Job Training Supplement

FIGURE 4. DIFFERENCES IN HOURLY WAGE BY TRAINING FOR TECHNICAL, SALES AND ADMINISTRATIVE SUPPORT OCCUPATIONS



Source: CPS 1991 Job Training Supplement

C. Comparisons Using the 1998 Current Population Survey

Table 2 is a summary of average hourly wage rates by occupation and educational level constructed from the 1998 Current Population Survey. The table is constructed using the 6,729 individuals who reported both educational attainment and wages and is presented for comparison with Table 1. Education categories consist of less than high school diploma, high school diploma, some college (no degree), vocational associate degree, academic associate degree and a four-year college degree.

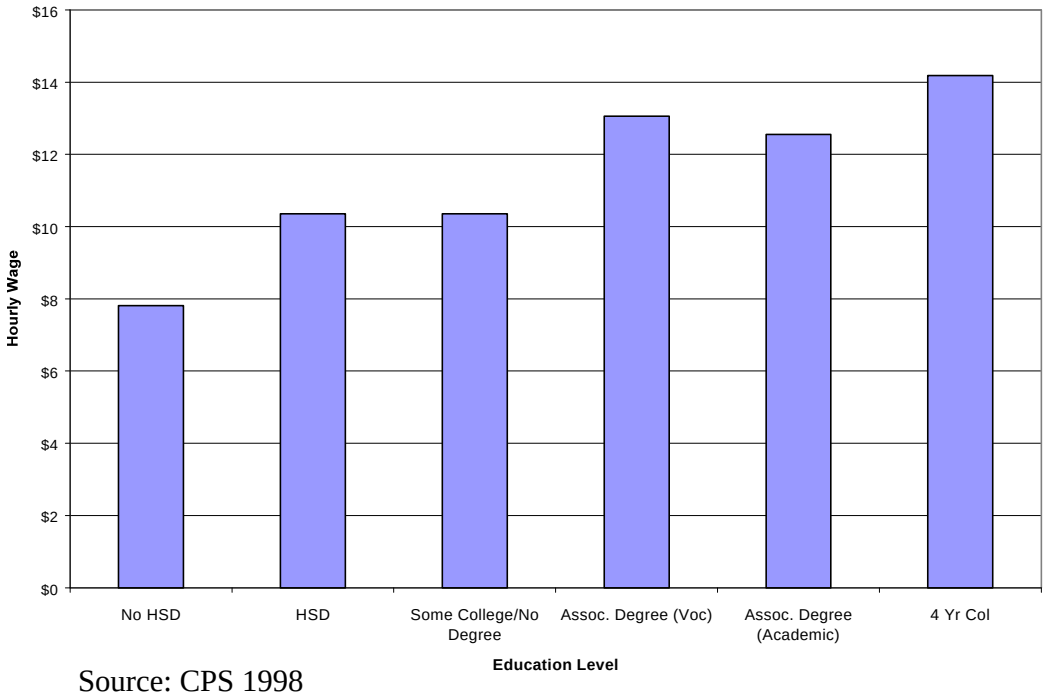
Tbl-2.

Occupations and Subdivisions (1998 CPS Annual Demographic File)	Sample Size	No HSD	HSD	1 Yr College	Associate Degree (Voc.)	Associate Degree (Academic)	4 Yr College
Technicians and Related Support	**299**	**7.31**	**11.94**	**12.18**	**12.79**	**14.28**	**16.02**
Health Technologists and Technicians		7.62	11.46	11.12	12.62	14.73	17.10
Engineering and Science Technicians		8.00	12.46	13.33	12.35	15.75	13.78
Engineering, and Science		6.00	12.20	13.05	23.00	10.26	17.06
Sales	**822**	**6.90**	**7.79**	**7.78**	**9.71**	**8.81**	**10.23**
Supervisors and Proprietors, Sales		13.03	11.12	8.87	10.02	10.46	9.33
Other Sales Related		6.41	7.13	7.57	9.56	8.17	10.48
Administrative Support, Including Clerical	**1423**	**7.31**	**9.98**	**9.76**	**10.70**	**11.01**	**11.03**
Supervisors-Administrative Support		8.88	12.57	12.50			13.88
Computer Equipment Operators		9.00	13.30	13.39	10.00	7.00	9.90
Secretaries, Stenographers, and Typists		6.74	10.29	9.58	10.42	10.90	10.09
Financial Records, Processing		8.22	9.70	10.00	9.86	9.60	10.56
Mail and Message Distributing		8.60	12.34	12.12	12.19	15.34	12.06
Other Administrative Support, Including Clerical		7.09	9.46	9.16	11.06	11.00	11.06
Protective Services	**158**	**6.35**	**12.83**	**12.15**	**17.17**	**14.86**	**14.94**
Other Services, Not Protect.	**1302**	**6.48**	**7.38**	**6.88**	**7.20**	**7.86**	**9.98**
Health Services		6.86	7.91	8.14	8.37	8.90	8.82
Cleaning and Building Services		7.57	7.90	8.60	10.33	10.08	10.50
Personal Services		5.83	7.84	7.95	6.96	10.22	15.88
Precision Production, Craft, and Repair	**1067**	**8.73**	**11.17**	**10.94**	**11.85**	**12.19**	**11.46**
Mechanic and Repairers		10.26	13.72	14.56	17.12	17.02	17.29
Construction Trades		11.57	15.65	16.33	17.34	13.82	12.67
Other Precision Production		10.19	12.64	13.74	14.81	12.99	11.81
Machine Operators, Assemblers, and Inspectors	**387**	**10.18**	**11.56**	**10.83**	**9.25**	**11.60**	**11.29**
Machine Operators and Tenders, Except Precision		8.77	10.97	10.80	10.45	10.90	12.40
Fabricators, Assemblers, Inspectors, and Samplers		8.66	11.55	11.22	12.89	13.11	10.21
Transportation and Material Moving Equipment	**455**	**7.32**	**9.46**	**9.76**	**8.76**	**9.49**	**9.52**
Motor Vehicle Operators		10.10	11.06	10.23	8.33	11.94	11.23
Other Transportation Occupations and Material Movers		10.35	12.87	13.33	10.17	10.93	11.97
Freight, Stock, and material Handlers		6.60	9.48	10.22	9.01	11.63	6.57
Other Handlers, Equipment Cleaners, and Laborers	**111**	**6.45**	**8.35**	**8.45**	**7.42**		**8.26**
Farming, Forestry, and Fishing	**705**	**10.75**	**14.09**	**14.99**	**16.72**	**14.75**	**14.73**
Farm Operators				10.00			10.00
Farm Workers and Related		6.47	8.33	8.38	7.42		7.82
Forestry and Fishing		5.25	8.53	7.69			

In Table 2 the highest wages for technicians, administrative support, sales, and other service occupations were associated with a four-year degree. Yet, similar to Table 1, many of the blue-collar occupations reached their highest hourly wage with a vocational associate degree or less. For these occupations, additional education beyond an associate degree is probably gained at the expense of specific training or on-the-job experience.

Figure 5 shows that wage rates tend to rise with education. Figure 5 also shows a relatively large wage premium for individuals with associate degrees, both vocational and academic, over individuals who attend college but do not finish. Interestingly, persons who report attending college but did not finish, receive a wage rate equivalent to high school graduates. The observed differences in annual earnings between those with some college and those with just a high school degree can be attributed in part to differences in hours worked. Individuals with some college worked on average 1.8 hours per week more than individuals with only a high school diploma.

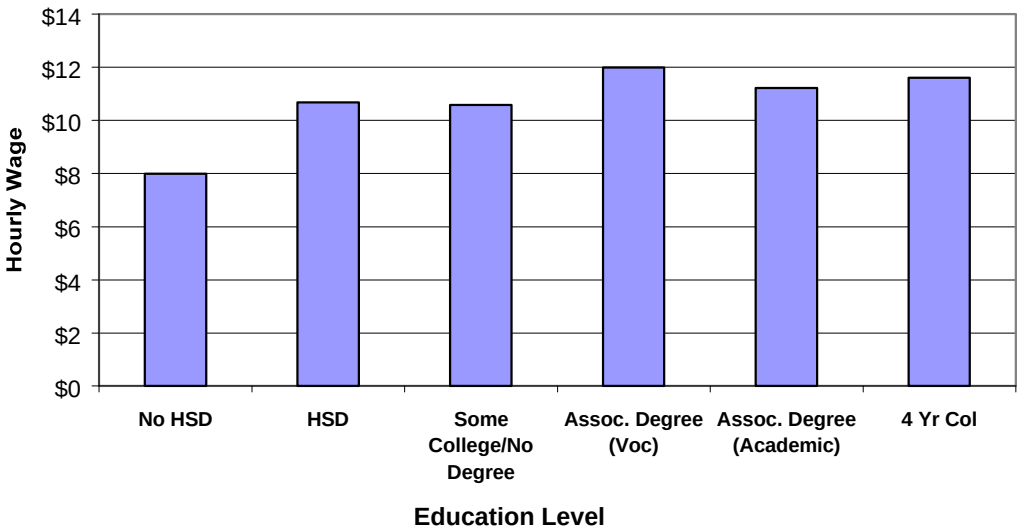
FIGURE 5. AVERAGE WAGES BY EDUCATION LEVEL FOR ALL OCCUPATIONS (FROM CPS 1998)



Source: CPS 1998

Within service and blue-collar occupations the largest increase in hourly wage rates comes with the acquisition of a high school diploma (Figure 6). There is no substantial difference in average wage rates for individuals with a high school diploma and individuals with some college but no degree. Wages for service and blue-collar occupations peak with the acquisition of a vocational associate degree. Additionally, Figure 6 shows that individuals within these occupations who acquire a vocational associate degree earn more on average than individuals with either an academic associate degree or a college degree. Since most service and blue-collar occupations do not require a college degree, and a vocational associate degree is predominantly comprised of training for blue-collar work, this wage difference is expected. However, it suggests that general schooling, such as college, may not be a perfect substitute for job specific vocational training for these occupations. Additionally, this wage differential suggests that individuals may self-select into training programs and occupations for which they are best suited.

FIGURE 6. AVERAGE WAGES BY EDUCATION LEVEL FOR SERVICES AND BLUE COLLAR OCCUPATIONS (FROM CPS 1998)



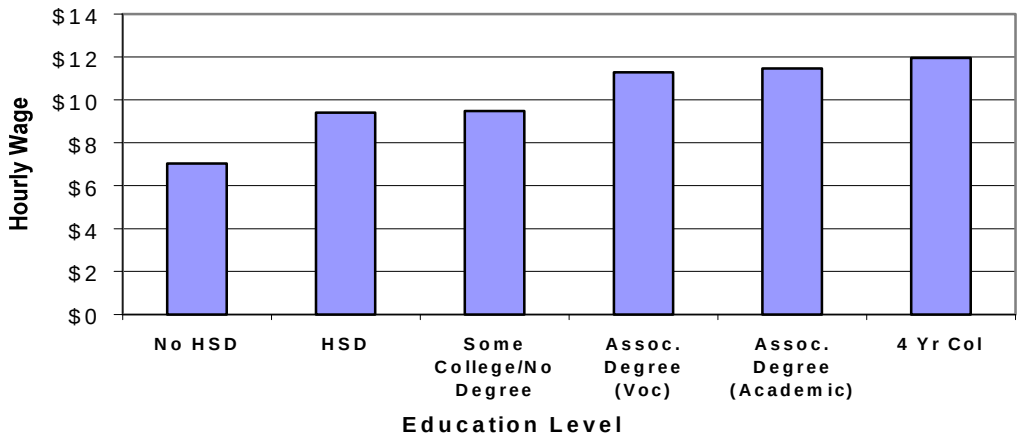
Source: CPS 1998

For technical, sales and administrative support occupations, educational attainment is positively related to hourly wage (Figure 7). However, the relatively large differences in wages between education levels suggest that the acquisition of a diploma or certification may play an important role in determining the wages for these occupations.

D. Summary

The relationship between education or training and wages in general is positive. Training appears to have an influence on wage rates in all occupational groupings. However, education seems to have a greater influence on wages in technical sales and administrative occupations, whereas training has a greater influence on wages for blue-collar and service occupations.

FIGURE 7. AVERAGE WAGES BY EDUCATION LEVEL FOR TECHNICAL, SALES, AND ADMINISTRATIVE SUPPORT OCCUPATIONS



Source: CPS 1998

Regression Estimation of Wage Equations

The analysis in Section III illustrates how, on average, wage rates vary with educational attainment and training. However, the analysis does not control for several key determinants of wages, such as job tenure, the amount or type of training, participation in government sponsored works program, and characteristics of the trainee, such as age, race, and gender. Each of these characteristics is expected to affect the wage rate an individual receives. Thus, to isolate the effect of education and training on wage rates, it is necessary to control for these factors. Constructing a table that controls for all these variables is infeasible. However, regression analysis allows us to control for these other influences on wage rates and thus provide a clearer picture of the relationships that exist between wages and training.

The 1991 CPS Jobs Training Supplement was used to estimate the effect of training on wages controlling for other factors that are expected to affect wages. Hourly earnings of 8,954 respondents were reported. However, of the individuals reporting hourly earnings, only 7,924 individuals provide information on both training and education. Table 3 below compares the means of individual characteristics in both the sample used in estimation and entire 1991 Job Training

TABLE 3. A COMPARISON OF ESTIMATION SAMPLE TO THE 1991 JOBS TRAINING SUPPLEMENT SURVEY

Characteristics	Estimation Sample Means	Survey Means
Age	36.0	37.5
Race (% White)	86.1	86.2
Sex (% Female)	52.1	51.8
Hourly Earnings	8.91	8.83

Supplement. The sex, race, average age, and hourly wages of individuals in the estimation sample are similar to those in the means of the full 1991 Jobs Training Supplement, and thus the use of only 7,924 observations should not bias the results. Summary statistics for the variables used in the estimation are presented in Appendix.

Since it has been suggested that single Ordinary Least Squares (OLS) estimates may be biased, and since Heckman's (1979) two-stage approach corrects for some of the potential biases, the two-stage model is used in estimation. The literature suggests that the effect of training differs by gender and by occupation. For comparison we produce three sets of estimates. The first set contains a single regression that estimates the effect of training for the entire sample of 7,924 individuals. This regression provides the average effect training has on wages across all occupations and both sexes. The second set divides the sample by gender to estimate separate regressions for males and females. By estimating separate regressions we can isolate gender-specific wage effects of training. The third set divides the sample into 12 occupational groups. A common perception is that within some specialized occupations wages are highly positively correlated with the amount of training an individual has, while in other non-specialized occupations training may have only a small influence on wages. By estimating separate regressions for each of the 12 occupational groups we allow for training to have different wage effects for each occupation. These three sets of estimates allow us to both measure wage effects of training and determine who benefits most from training.

The dependent variable in the first stage of the estimation is the probability of having received training (TRAIN). The first stage in all three sets of regressions contain independent variables that control for the individual's perception of his skills (ADEQSKIL), the individual's race (NONWHITE=1), age, the months of tenure with the current employer (MTENURE), and the individual's educational attainment measured in years of schooling (GRADE). The gender of the individual (FEMALE=1) is included in the regression using the entire sample and those stratified by occupation.

The dependent variable in each of the main equations is the log of hourly wage, LOGEARN. The three estimations contain independent variables that control for the presence of training (TRAIN=1 if the individual reports having received training), the categorical amount of training (TRNLNGTH=1, 2, 3 or 4 if the individual received a week or less, 2-12 weeks, 13-25 weeks or 26 weeks or more training respectively), age in years (AGE), age squared (AGE2), the number of years of experience in the present type of work[9] (EXP), experience squared (EXP2), race (NONWHITE=1), gender (FEMALE=1), the presence of children under 18 (CHILD18=1), and a set of educational attainment variables, both secondary and post-secondary (GRADE indicates the number of years of education while SOMEHI, HI, and SOMECOLL represent attending high school, completing high school, and attending college, respectively). The squares of age (AGE2), and experience (EXP2) and the interaction between age and experience (AGEEXP) were included to control for the possibility of a non-linear relationship between age, tenure and wages. Some individuals received employment counseling and possibly job training as part of the Job Training Partnership Act (JTPA); a dummy variable (JTPA) was included to account for this in the regression analysis. Table 4 summarizes and briefly describes the variables used in estimation. The first stage of the model provides estimates of the probability of having received training. From this first stage the variable LAMBDA is constructed and included as a regressor in the second stage as a control for selectivity in the acquisition of training. Table 5 presents the first and second stage results for the entire sample. The overall results of the two-stage estimation are consistent with the findings in the established literature.

Consider the first stage regression results. The variable ADEQSKIL represents a person's perception about their skills adequacy for their current job. The skills covered are reading, writing, math and computer usage. A person who rates their skills adequacy at 3 is saying that their skills in three of the four categories are adequate for their current position. The first stage indicates that the probability of receiving training is positively correlated with a person's perception of their skills adequacy. This result means that individuals who believe their skills are adequate for

[9] AGE and EXP have a correlation coefficient of .5380.

TABLE 4. VARIABLE DESCRIPTION

Variable	Description
LOGEARN	LOGEARN is the natural log of hourly dollar earnings.
TRAIN	TRAIN is a zero-one dummy. TRAIN equals one if the individual reports receiving training.
ADEQSKIL	ADEQSKIL is a combination of four zero-one dummies from the 1991 CPS Job Training Supplement. People are asked if their skills in four subject areas (math, reading, writing and computer) are adequate for their current position. Adequate is coded as a "1." ADEQSKIL is calculated as the sum of the individual's perceived adequacy in each of these four areas. ADEQSKIL may take on values 0 to 4. For example, if an individual feels his skills is adequate in 3 of the 4 areas Adeqskil=3.
TRNLNGTH	TRNLNGTH is a categorical variable. If the individual received a week or less, 2-12 weeks, 13-25 weeks or 26 weeks or more training TRNLNGHT equals 1, 2, 3 and 4 respectively.
JTPA	JTPA is a zero-one dummy. If the individual participated in training via the Job Training Partnership Act then JTPA=1.
SOMEHI	SOMEHI is a zero-one dummy. If an individual attends high school but does not graduate, SOMEHI=1. If SOMEHI=1 then HIGH and SOMECOLL both must be zero.
HIGH	HIGH is a zero-one dummy. If an individual attends high school and graduates, HIGH=1. If HIGH=1 then SOMEHI and SOMECOLL both must be zero.
SOMECOLL	SOMECOLL is a zero-one dummy. If an individual attends college then SOMECOLL=1. If SOMECOLL=1 then SOMEHI and HIGH both must be zero.
GRADE	GRADE is the highest grade attended and completed.
NONWHITE	NONWHITE is a zero-one dummy. If an individuals is non-white then NONWHITE=1.
FEMALE	FEMALE is a zero-one dummy. If an individuals is female then female=1.
CHILD18	CHILD18 is a zero-one dummy. If a child or children under 18 are present then CHILD18=1.
EXP	EXP is the number of years experience an individual has in the current type of occupation.
EXP2	EXP2 is the individual's experience squared.
AGE	AGE is the individual's age in years.
AGE2	AGE2 is the individual's age squared.
AGEEXP	AGEEXP is the multiplicative interaction of AGE and EXP.
MTENURE	MTENURE is the number of months an individual has spent with his current employer.
LAMBDA	Lambda is the Inverse Mills Ratio.

TABLE 5. REGRESSION RESULTS

Stage 1 Dependant Variable: Probability of Receiving Training	Coeff.	t-ratio
CONSTANT	-1.43858	-21.9444
ADEQSKIL	0.403754	29.953
NONWHITE	-0.0858	-1.98362
AGE	-0.00113	-0.85718
MTENURE	0.001372	6.7703
GRADE	0.065427	8.03107
FEMALE	-0.00473	-0.15619
Stage2. Dependant Variable: Natural Log of Hourly Wages	Coeff.	t-ratio
CONSTANT	1.03807	26.5505
TRAIN	0.113571	4.41755
TRNLNGTH	0.059053	16.1901
JTPA	-0.0286	-0.85068
SOMEHI	-0.12706	-8.30334
HIGH	-0.03842	-3.18779
SOMECOLL	0.102222	7.20721
NONWHITE	-0.05154	-4.02587
FEMALE	-0.26436	-29.4207
CHILD1	-0.00218	-0.2339
EXP	0.021658	7.49341
EXP2	-0.00048	-6.81877
AGE	0.048317	21.4392
AGE2	-0.00056	-18.5782
AGEEXP	0.000115	1.43621
LAMBDA	-0.00187	-0.11648

their current job are more likely to have received training. Individuals with more education (GRADE) and more experience with their current employer (MTENURE) are more likely to receive training than those with less. This may be partially the result of the signaling effect described earlier. However, older individuals are less likely to receive training than younger individuals. This may be due to older workers substituting on-the-job experience for other types of formal or informal training. Non-whites are less likely to receive training than whites.

In the second stage we are able to discern the effects of the acquisition of training on hourly wage controlling for educational attainment, for the probability of obtaining training, and for other factors. The second stage indicates that for the entire sample attending high school and graduating from high school have a negative impact on hourly wages over never attending high school. However, attending college has a strong positive impact on wages. After controlling for educational attainment, both the presence and the length of training have a positive and significant influence on wages. The acquisition of training increased hourly wages an average of 4.6 percent for the entire sample. As expected, being females or nonwhite is associated with lower hourly wages.

For both males and females, individuals who believe their skills are adequate for their current job are more likely to have received training. Individuals with more education and more experience with their current employer are also more likely to receive training than those with less. Unlike the results from the full sample, non-white females are no less likely to receive training than white females. However, black males are less likely to receive training than their white-male counterparts.

Training has a positive and significant influence on hourly wages for both men and women; however, for women the effect is larger than for men. Similarly, longer periods of training are associated with higher wages; however, the effect is larger for women. One notable gender-based difference comes in the wage response to the presence of children under 18. Females with children under 18 earn less than other females, while men with children under 18 earn more than otherwise similar men. Table 6 below presents the estimated wages of selected individuals for quick comparison. The impact that training has on hourly wages of a particular group is

TABLE 6. PREDICTED WAGES FOR SELECTED GROUPS

	Untrained White Male	Trained White Male	Untrained Nonwhite Male	Trained Nonwhite Male
No High School	$ 8.38	$ 9.33	$ 7.60	$ 8.46
Some High School	$ 7.61	$ 8.47	$ 6.90	$ 7.68
High School	$ 8.56	$ 9.53	$ 7.76	$ 8.65
Some College	$ 9.46	$ 10.54	$ 8.58	$ 9.55

	Untrained White Female	Trained White Female	Untrained Nonwhite Female	Trained Nonwhite Female
No High School	$ 6.05	$ 7.66	$ 5.96	$ 7.55
Some High School	$ 5.19	$ 6.58	$ 5.12	$ 6.49
High School	$ 5.53	$ 7.00	$ 5.45	$ 6.91
Some College	$ 6.56	$ 8.31	$ 6.47	$ 8.19

given by the difference in adjacent columns. The impact that education has on hourly wages of a particular group is given by the difference within a column. Surprisingly, hourly wages do not always increase with education.

For the occupation-stratified regressions the perception of ones' own skills continued to be strongly positively correlated with the acquisition of training. Being female reduced the probability of receiving training for most occupations except for administrative support and other services. Being non-white also reduced the likelihood of training for occupations other than machine administrative support, handlers and equipment cleaners and other services.

Training had a positive effect on hourly wages in 7 of the 12 occupation categories (5 were statistically significant). Training length had a positive effect on hourly wages in all but one of the 12 occupations (8 were statistically significant). In 5 of the 12 occupations training was associated with declines in hourly wages, and one of the 12 occupations training length was associated with a decline in hourly wages. However, none of declines in hourly wages were statistically significant. After controlling for training, females and non-whites received lower wages than their white and male counterparts. Table 7 presents the estimated wages for each of the occupations by educational attainment.

Tbl-7.

		Untrained White Male	Trained White Male	Untrained White Female	Trained White Female	Untrained Nonwhite Male	Trained Nonwhite Male	Untrained Nonwhite Female	Trained Nonwhite Female
Executive, Administrative and Managerial*	No High School	$ 7.93	$ 10.63	$ 5.67	$ 7.59	$ 7.04	$ 9.42	$ 5.03	$ 6.73
	Some High School	$ 6.00	$ 8.03	$ 4.29	$ 5.74	$ 5.32	$ 7.12	$ 3.80	$ 5.09
	High School	$ 7.69	$ 10.29	$ 5.49	$ 7.35	$ 6.81	$ 9.13	$ 4.87	$ 6.52
	Some College	$ 8.95	$ 11.99	$ 6.39	$ 8.56	$ 7.94	$ 10.63	$ 5.67	$ 7.59
Professional Specialty*	No High School	$ 11.57	$ 12.92	$ 9.52	$ 10.63	$ 11.12	$ 12.41	$ 9.14	$ 10.21
	Some High School	$ 7.51	$ 8.38	$ 6.17	$ 6.89	$ 7.21	$ 8.05	$ 5.93	$ 6.62
	High School	$ 8.78	$ 9.80	$ 7.22	$ 8.06	$ 8.43	$ 9.42	$ 6.94	$ 7.74
	Some College	$ 11.18	$ 12.48	$ 9.20	$ 10.27	$ 10.74	$ 11.99	$ 8.83	$ 9.87
Technicians and Related Support	No High School	$ 8.87	$ 9.36	$ 6.29	$ 6.64	$ 8.86	$ 9.35	$ 6.29	$ 6.63
	Some High School	$ 6.24	$ 6.58	$ 4.42	$ 4.67	$ 6.23	$ 6.57	$ 4.42	$ 4.66
	High School	$ 7.50	$ 7.91	$ 5.32	$ 5.61	$ 7.49	$ 7.90	$ 5.31	$ 5.60
	Some College	$ 9.54	$ 10.06	$ 6.76	$ 7.14	$ 9.53	$ 10.05	$ 6.76	$ 7.13
Sales*	No High School	$ 6.53	$ 9.25	$ 5.27	$ 7.46	$ 6.92	$ 9.80	$ 5.58	$ 7.90
	Some High School	$ 5.89	$ 8.34	$ 4.75	$ 6.73	$ 6.24	$ 8.84	$ 5.03	$ 7.13
	High School	$ 6.15	$ 8.70	$ 4.96	$ 7.02	$ 6.51	$ 9.22	$ 5.25	$ 7.44
	Some College	$ 7.26	$ 10.28	$ 5.86	$ 8.29	$ 7.68	$ 10.88	$ 6.20	$ 8.78
Administrative Support (Including Clerical)	No High School	$ 8.48	$ 9.63	$ 6.39	$ 7.26	$ 8.62	$ 9.80	$ 6.50	$ 7.39
	Some High School	$ 7.95	$ 9.03	$ 5.99	$ 6.80	$ 8.08	$ 9.18	$ 6.09	$ 6.92
	High School	$ 8.56	$ 9.72	$ 6.45	$ 7.33	$ 8.70	$ 9.89	$ 6.56	$ 7.45
	Some College	$ 9.41	$ 10.69	$ 7.09	$ 8.06	$ 9.57	$ 10.87	$ 7.21	$ 8.19
Protective Services	No High School	$ 7.31	$ 8.21	$ 4.93	$ 5.54	$ 6.55	$ 7.36	$ 4.42	$ 4.97
	Some High School	$ 6.03	$ 6.77	$ 4.07	$ 4.57	$ 5.40	$ 6.07	$ 3.65	$ 4.10
	High School	$ 8.16	$ 9.17	$ 5.51	$ 6.19	$ 7.32	$ 8.22	$ 4.94	$ 5.55
	Some College	$ 9.83	$ 11.05	$ 6.64	$ 7.46	$ 8.82	$ 9.91	$ 5.95	$ 6.69
Other Services*	No High School	$ 5.57	$ 6.86	$ 4.46	$ 5.48	$ 5.64	$ 6.94	$ 4.51	$ 5.55
	Some High School	$ 5.54	$ 6.82	$ 4.43	$ 5.45	$ 5.60	$ 6.89	$ 4.48	$ 5.51
	High School	$ 5.74	$ 7.07	$ 4.59	$ 5.65	$ 5.81	$ 7.15	$ 4.65	$ 5.71
	Some College	$ 5.98	$ 7.36	$ 4.78	$ 5.88	$ 6.05	$ 7.44	$ 4.84	$ 5.95
Precision Production*	No High School	$ 9.35	$ 9.71	$ 6.01	$ 6.24	$ 8.45	$ 8.77	$ 5.43	$ 5.63
	Some High School	$ 9.13	$ 9.48	$ 5.87	$ 6.09	$ 8.25	$ 8.56	$ 5.30	$ 5.50
	High School	$ 10.42	$ 10.81	$ 6.69	$ 6.95	$ 9.41	$ 9.77	$ 6.05	$ 6.28
	Some College	$ 10.73	$ 11.13	$ 6.89	$ 7.15	$ 9.69	$ 10.06	$ 6.23	$ 6.46
Machine Opporators*	No High School	$ 7.47	$ 9.10	$ 5.52	$ 6.74	$ 7.08	$ 8.64	$ 5.24	$ 6.39
	Some High School	$ 7.94	$ 9.68	$ 5.87	$ 7.16	$ 7.53	$ 9.18	$ 5.57	$ 6.79
	High School	$ 8.62	$ 10.51	$ 6.38	$ 7.78	$ 8.18	$ 9.97	$ 6.05	$ 7.38
	Some College	$ 8.88	$ 10.83	$ 6.57	$ 8.01	$ 8.42	$ 10.27	$ 6.23	$ 7.60
Transportation*	No High School	$ 9.09	$ 7.97	$ 6.56	$ 5.76	$ 8.20	$ 7.19	$ 5.93	$ 5.20
	Some High School	$ 8.71	$ 7.64	$ 6.29	$ 5.52	$ 7.86	$ 6.90	$ 5.68	$ 4.98
	High School	$ 9.31	$ 8.16	$ 6.72	$ 5.90	$ 8.40	$ 7.37	$ 6.07	$ 5.32
	Some College	$ 9.73	$ 8.53	$ 7.03	$ 6.17	$ 8.79	$ 7.70	$ 6.35	$ 5.57
Handlers & Equipment Cleaners	No High School	$ 5.92	$ 7.13	$ 4.50	$ 5.43	$ 5.66	$ 6.82	$ 4.31	$ 5.19
	Some High School	$ 5.84	$ 7.03	$ 4.44	$ 5.35	$ 5.58	$ 6.73	$ 4.25	$ 5.12
	High School	$ 6.67	$ 8.04	$ 5.08	$ 6.12	$ 6.38	$ 7.69	$ 4.86	$ 5.85
	Some College	$ 7.35	$ 8.85	$ 5.59	$ 6.74	$ 7.03	$ 8.47	$ 5.35	$ 6.45
Farming, Forestry, & Fishing	No High School	$ 5.96	$ 4.59	$ 4.11	$ 3.16	$ 5.48	$ 4.22	$ 3.78	$ 2.91
	Some High School	$ 5.87	$ 4.52	$ 4.05	$ 3.11	$ 5.40	$ 4.16	$ 3.72	$ 2.87
	High School	$ 6.37	$ 4.90	$ 4.39	$ 3.38	$ 5.87	$ 4.51	$ 4.04	$ 3.11
	Some College	$ 8.40	$ 6.46	$ 5.79	$ 4.45	$ 7.73	$ 5.95	$ 5.33	$ 4.10

Occupations for which training is statistically significant

Occupations for which training length is statistically significant*

Conclusion

Tables 1 through 7, and the literature provide evidence that training has a positive influence on wages. Each of the three econometric specifications provides further support. However, the gender-stratified regressions suggest that training is more important in determining females' wages. Furthermore, in the occupation-stratified regressions the amount of training seems to be more important than the presence of training in determining hourly wages. Two things should be considered when interpreting the findings.

1) We do not know if the individuals use their training at their current job. Since training is assumed to be job-specific, individuals who's jobs require their particular training would likely be more productive than those without, and, subsequently, would receive a higher wage rate. Thus, the lack of such information increases the error and biases the estimated effects of training on wage rates downward.

2) Fringe benefits are viewed as substitutes for wages; insurance and retirement programs are often provided in place of higher hourly wages. Thus, total compensation may greatly increase an individual's effective earnings. However, neither of the two CPS data sets utilized in this report contain information about fringe benefits.

Appendix

Below is a list of descriptive statistics for the variables used in the regressions above.

Variable	Mean	Std. Dev.	Minimum	Maximum	Num Cases
LOGEARN	2.05693	0.501112	-0.693147	4.56591	7924
TRAIN	0.51893	0.499673	0	1	7924
ADEQSKIL	3.05439	1.33098	0	4	7924
TRNLNGTH	0.925795	1.54598	0	4	7924
JTPA	0.018046	0.133128	0	1	7924
SOMEHI	0.148157	0.355278	0	1	7924
HIGH	0.425164	0.494399	0	1	7924
SOMECOLL	0.210878	0.407958	0	1	7924
GRADE	2.77827	1.86721	0	7	7924
NONWHITE	0.13844	0.345383	0	1	7924
FEMALE	0.521075	0.499587	0	1	7924
CHILD18	0.451035	0.497628	0	1	7924
EXP	7.49041	8.14661	0	60	7924
EXP2	122.465	253.396	0	3600	7924
AGE	35.9947	12.8956	15	84	7924
AGE2	1461.89	1043	225	7056	7924
AGEEXP	326.133	446.906	0	4800	7924
MTENURE	69.5906	84.5418	1	540	7924
LAMBDA	-1.88E-10	0.757289	-1.50737	1.91586	7924

References

Ashenfelter, Orley and Card, David, "Using Longitudinal Structure of Earnings to Estimate the Effects of Training Programs," Review of Economics and Statistics, Vol. 65, November 1985, pp. 648-660.

"Average Annual Incomes for Persons by Educational Attainment, 1997," Postsecondary Education Opportunity (www.postsecondary.org).

Bassi, Laurie J., "The Effect of CETA on the Postprogram Earnings of Participants." Journal of Human Resources, 1983, pp. 539-56.

Bloom, et. al., "The Benefits and Costs of JTPA Title II-A Programs: Key Findings from the National Job Training Partnership Act Study," Journal of Human Resources, Summer 1997, pp. 549-76.

Bloom, Howard S., "Estimating the Effect of Job-Training Programs, Using Longitudinal Data: Ashenfelter's Findings Reconsidered," Journal of Human Resources, Vol. 19, No. 4, 1984.

Bound, John and Johnson, George, "Changes I the Structure of Wages in the 1990s: An Evaluation of Alternative Explanations." American Economic Review, Vol. 82, No. 3, 1992, pp. 371-392.

Diskerson, Katherine P., Johnson, Terry R., and West, Richard W., "An Analysis of the Impact of CETA Programs on Participants' Earnings," Journal of Human Resources, Vol. 21, Winter 1986, pp. 648-660.

Ehrenberg, Ronald G., and Smith, Robert, *Modern Labor Economics: Theory and Public Policy, 2nd ed.* Scott, Foresman and Company, Glenview, IL 1985.

Gay, Robert S., and Borus, Michael E., "Validating Performance Indicators for Employment and Training Programs." Journal of Human Resources. 1980. pp. 539-56.

Greene, William, H., "Sample Selection Bias Error: Comment." Econometrica, Vol. 49, No. 3, May 1981, pp. 795-98.

Hamermesh, Daniel S., and Rees, Albert, *The Economics of Work and Pay,* Harper and Row, New York, NY, 1988.

Heckman, James J., "Sample Selection Bias as a Specification Error." Econometrica, Vol. 47, No. 1, January 1979, pp. 153-161.

Jaegar, David A., and Page, Marianne E., "Degree Matters: New Evidence on Sheepskin Effects in the Returns to Education." Review of Economics and Statistics 78, November 1996, pp. 733-38.

LaLonde, Robert J., "Evaluating the Econometric Evaluations of Training Programs with Experimental Data." *The Economics of Training*. Vol. 2, 1996, pp. 407-23.

Lillard, Lee A., and Tan, Hong W., "Private Sector Training: Who Gets It and What are Its Effects?" in Ronals Ehrenberg (ed.), *Research in Labor Economics*, J.A.I. Press, pp. 1-62.

Maddala, G.S., *Limited Dependent and Qualitative Variables in Econometrics.* New York: Cambridge University Press, 1983.

McMahon, Walter W., "Relative Returns to Human and Physical Capital in the U.S. and Efficient Investment Strategies." Economics of Education Review, Vol. 10 No. 4, January 1991, pp. 283-296.

Murphy, Kevin M., and Welch, Finis, "The Structure of Wages," Quarterly Journal of Economics, February 1992, pp. 285-326.

Hollister, Robinson G., and Maynard, Rebecca A., "The Impacts of Supported Work on AFDC Recipients," in Robinson, G. Hollister, Kemper, Peter and Maynard, Rebecca A., (eds.), *The National Supported Work Demonstration*, Madison: University of Wisconsin Press, Chapter 4, 1984, pp. 90-135.

Pergamit, Michael R., and Shack-Marquez, Janice, "Earnings and Different Types of Training." BLS Working Paper #165, June 1987.

Schiller, Bradley. "Lessons from WIN: A Manpower Evaluation." Journal of Human Resources, 1978, pp. 502-23.

Willis, Robert J., and Rosen, Sherwin, "Education and Self-Selection." Journal of Political Economy, 1979, Vol. 87, No. 2, pp. S7-S36.

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